XV. *Description of the Cavern of Bruniquel, and its Organic Contents.*

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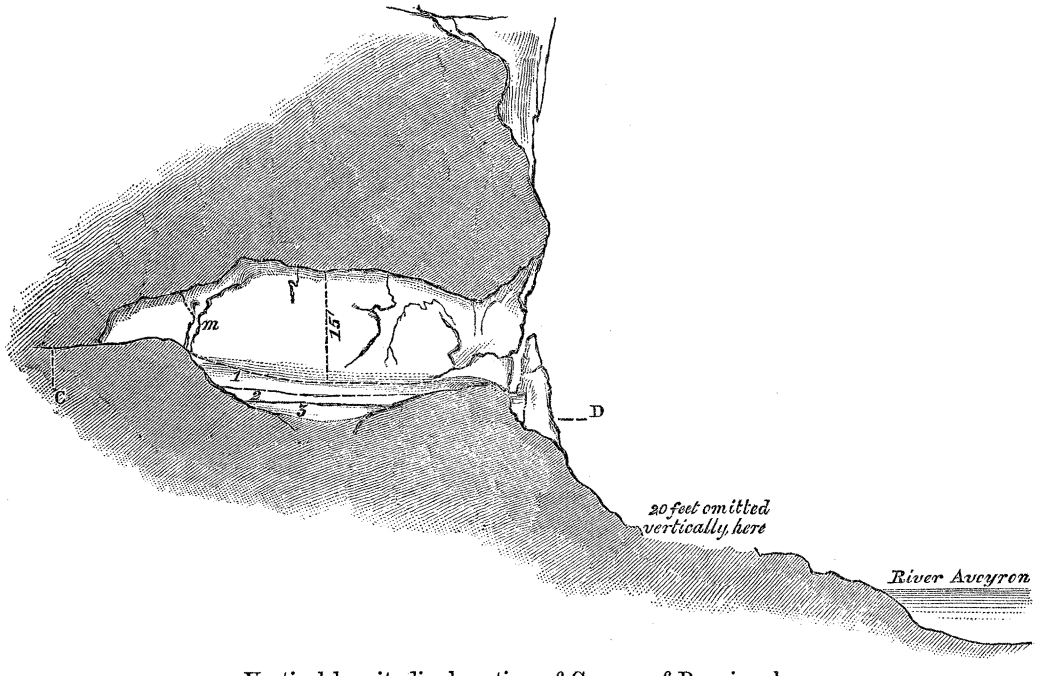
PART I.—HUMAN REMAINS.

THE Cavern of Bruniquel, briefly noticed by MARCEL DE SERRES in the subjoined passage from his work "Sur les Cavernes à Ossemens"*, is situated in a grand escarpment of the jurassic limestone bordering the river Aveyron, opposite the village of Bruniquel, Department of Tarn and Garonne.

The entry of the cavern is in the face of the cliff, about 40 feet above the bed of the river, partly concealed by a projecting peak of rock (fig. 1, D), behind which is a platform

Fig. 1.



Vertical longitudinal section of Cavern of Bruniquel.

showing evidence of having been artificially flattened, so as to serve apparently as a stand-point for defence.

The entry (now bricked up, with a door in charge of a keeper of the proprietor, the

* "3° Caverne de Bruniquel (Tarn). Celle-ci paraît être dans la couche la plus inférieure de la formation jurassique, c'est-à-dire dans le lias. Nous n'y avons rencontré que des ossemens de ruminans, savoir des cerfs et de bœufs, avec quelques débris d'oiseaux."—*Op. cit.* p. 142. [See Note, p. 519.—R. O., July, 1869.]

Vicomte DE LASTIC ST. JAL) is of an oblong form (fig. 2), about 20 feet in width, and from 8 to 12 feet in height; the cavern (fig. 4) widens a little beyond the entry, expanding to a breadth of about 50 feet two-thirds of the way towards the opposite end: the length of the cavern is between 60 and 70 feet; it has a pretty regular domed roof (fig. 3), and from the lowest part of the present excavated floor to the top is from 15 to 20 feet.

Fig. 2.

Entry of Cavern of Bruniquel.

The roof is evenly coated by a thin layer of stalactite, which now shows a few, and those but small, dependent processes; a larger columnar mass which reached to the floor near the back of the cave (fig. 1, *m*), had been removed before my visit (January 23rd, 1864). The original level of the peripheral part of the stalagmitic floor, was shown, at that date, by the adhesion to the wall of a portion projecting like a shelf, fig. 3, *s*, *s*, from 1 foot to $2\frac{1}{2}$ feet in breadth, and averaging 1 foot in thickness, along about two-thirds of the circumference of the cavern. Upon this shelf the stalactitic coating of the cavern-wall is continued; the shelf of stalagmite slopes slightly from the wall to its broken margin. The breccia exposed by the breaking up of the stalagmitic floor slopes irregularly towards the middle of the fore part of the cavern, where the excavations have been carried deepest. Blocks of breccia covered by the stalagmite had been succes-

sively detached, prior to my visit, by the workmen employed by the Vicomte DE LASTIC; most of them had been broken up for the extraction of the organic and fabricated remains, and the débris thrown down the steep approach to the entry.

These researches had been commenced by the Vicomte DE LASTIC in the preceding year. Some excavations had been made many years previously, probably in quest of nitre during the old revolutionary period of 1792–5, and also subsequently, for scientific purposes, bringing to light the organic remains noticed by MARCEL DE SERRES. Of the extent of these early explorations I could not obtain any definite idea; no particular note of the floor of the cavern having been recorded when the systematic explorations were commenced, in 1863, by the Vicomte DE LASTIC*.

The appearances noted by me in the exploration of the cavern, January 23, 1864, led me to conclude that the original stalagmitic floor, compacted after the cave had ceased to be inhabited, had sloped gradually from the circumference to the centre or thereabouts, the stalagmite becoming thinner as it receded from the walls. There was nothing to support a conclusion that the different levels of the remaining stalagmitic floor at the periphery, and of the exposed breccia towards the middle of the cave, were due to any uplifting of the cliff, or change of level of the cavern, since the period of its habitation; all the phenomena observed concurred in showing the different levels to be the result of the excavations and removals of a great proportion of the original floor and of the immediately subjacent breccia.

This breccia is a conglomerate of mud, with water-worn stones from the bed of the adjacent river, chiefly of the grey limestone, and also of the reddish limestone, of which the cliffs are composed, with, occasionally, fragments of a quartzose rock. These are imbedded in and cemented to the petrified mud of a blackish or reddish colour, in many

* [The reports of the discoveries made by the Vicomte DE LASTIC in his cavern led to visits being made to it by Naturalists and Archæologists from Toulouse and Montauban. MM. TRUTAT, MARTIN, and GARRIGOU communicated some results of their researches, December 10th, 1863, to the Académie Royale de Toulouse, but these have not been published. The earliest notice that I have been able to find, in print, is in the 'Bulletin de la Société d'Anthropologie de Paris' for 17th December 1863, in the form of an extract of a letter from M. GARRIGOU; it is headed "Découverte de deux mâchoires humaines dans la caverne de Bruniquel (Tarn et Garonne)." "Je suis rentré hier seulement d'une excursion dans le Tarn-et-Garonne, ou nous avons faites des fouilles considérables dans la caverne de Bruniquel," p. 651. That the cavern so called is the one here described I learnt from M. DE LASTIC, who caused the entry to the cavern to be secured in consequence of these and similar visits, attended with unauthorized removal of specimens. No other cavern so called was then, or had been previously, known in the vicinity of Bruniquel; it is therefore the cave noticed by MARCEL DE SERRES. The earliest notice in print that I can find of researches by M. BRUN, Keeper of the Museum at Montauban, in caverns in the vicinity of Bruniquel, is entitled, "Sur les fouilles pratiquées par M. BRUN dans la caverne-abri de Lafaye, in Bruniquel," in the 'Bulletin de la Société d'Anthropologie de Paris,' 18th Janvier, 1866. "La caverne-abri de Lafaye, fouillée avec le plus grand soin sous la direction de M. BRUN," &c.—*Op. cit.* p. 48. There is no evidence that the "caverne de Bruniquel," explored by MARCEL DE SERRES, the Vicomte DE LASTIC, and myself, has been known or described by any other name, or that its name has been applied to any other cave. It is the one nearest the village, though on the opposite bank of the Aveyron, and in the 'Commune de Penne.'—R. O. July 1869.]

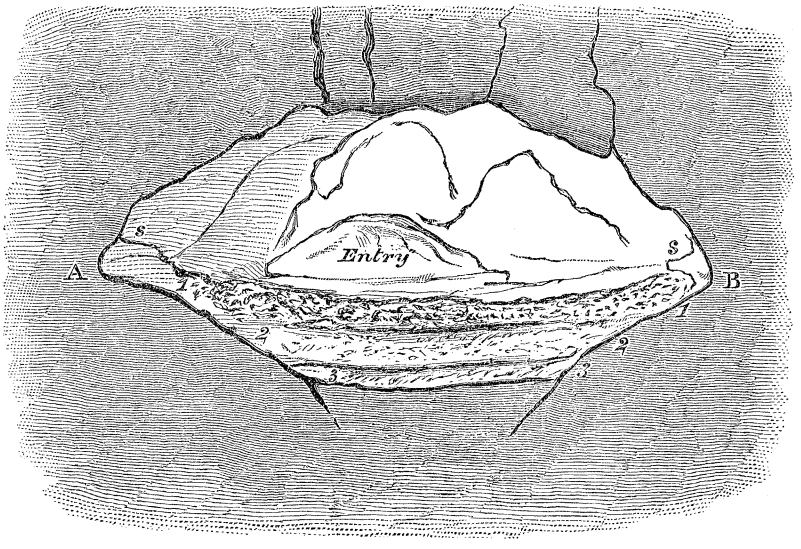
parts showing vacuities lined by stalagmite, and giving rise to a structure like that of travertin. Every part of such breccia is thickly charged with portions and fragments of bones, antlers, jaws, and teeth, implements of flint and bone, with here and there a shell; but these are very rare.

The dark or black colour of the calcified or partly calcified mud or rubble, caused by particles of carbon indicative of the burnt fuel in the cavern, so prevails in the uppermost 4 or 5 feet of the breccia, that it is called by the workmen the "limon noir" (fig. 3 1). Beneath this the original reddish colour of the mud prevails, and a depth of from 3 to 4 feet has been reached in this so-called "limon rouge" (ib. 2). In both beds the organic contents abound; in the lowest part which has been reached (ib. 3) they become less abundant.

The major part of the soil of the cavern, broken up and removed at the period of my visit, had acquired a degree of hardness, through the percolation of the calciferous drip, such as to require short blows of the pick-axe for its disruption; it was of a density which, like that of the travertin at Pæstum, might have served for the purposes of a building stone. But towards the centre of the floor this density becomes less than towards the periphery, the breccia graduating into a kind of rubble.

The first human skull which was discovered, December 17th, 1863, was preserved in the mass of stalagmitic breccia in which it was imbedded and with which it was detached. The mass firmly adhered by the stalagmite to the wall of the cavern in the hindmost recess, to the left on entering, marked *a* in figure 4 (plan of horizontal section). The skull was about 4 feet below the upper horizontal surface or floor of stalagmite. This floor exhibited no signs of recent disturbance; the workmen were pursuing their

Fig. 3.



Vertical transverse section, Cavern of Bruniquel.

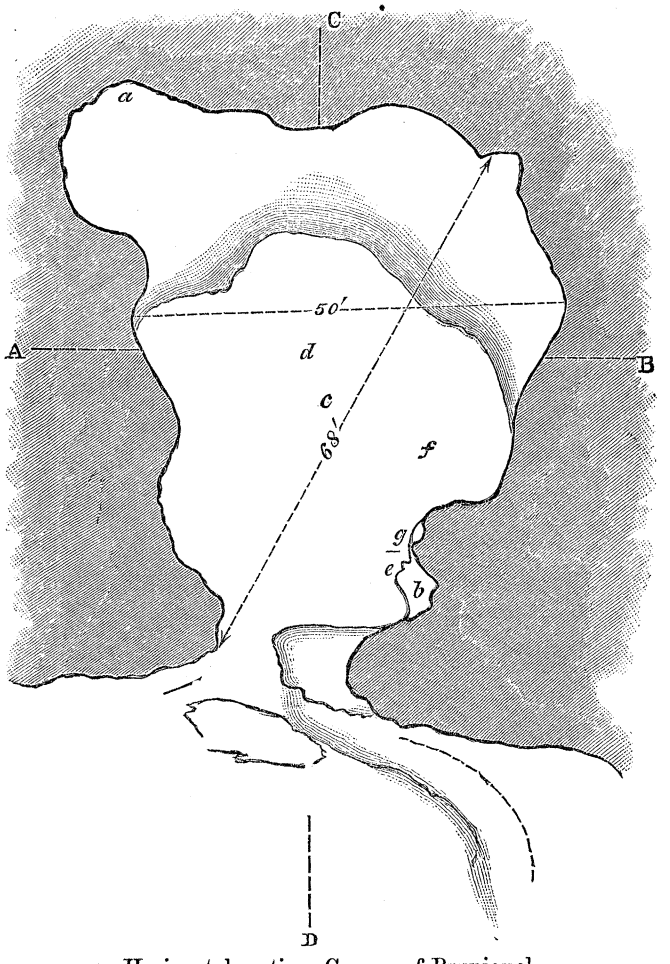
operations to get out stalagmite and breccia in masses convenient for extracting and working out the organized contents and implements, when their attention was arrested

by the appearance of the cranium (as in the specimen now in the British Museum, Register-No. 38300).

M. DE LASTIC determined on its preservation in the breccia, for submission to anatomists and palæontologists for subsequent examination, and the block containing it was carefully removed from the cavern.

Similar operations being carried on at other parts of the cavern, an immense block of stalagmitic breccia became detached at the recess, marked *b* in fig. 4, and portions of

Fig. 4.



Horizontal section, Cavern of Bruniquel.

two human crania became visible in the exposed surface of breccia adhering to the wall of the recess. The largest portion, including the calvarium (Register-No. 38307, British Museum), was situated 5 feet 2 inches from the upper surface of the stalagmite.

Like the hind part of the cranium above mentioned the more plastic material of the breccia, soft and moist at the period of the interment, had moulded itself to all the inequalities and contour of the surface of the calvarium, but with an interspace of from one to two lines in breadth, which was filled by pure stalagmite.

The portion of lower jaw, with the much worn tooth (Register-No. 38335, British

Museum), was extracted from breccia, at *e*, underlying the mass which yielded the calvarium.

The portions of upper and lower jaws (ib. 38334, 38337) were extracted from the less calcified breccia near the middle of the cavern, at about the depth of 4 feet at *d*, fig. 4.

The portions of upper and lower jaws (ib. 38336) with portions of cranium, were extracted from breccia at a depth of about 3 feet, at or near the position marked *f*, fig. 4 *.

The statement by the Vicomte DE LASTIC of the discovery of these human remains, in the letters of 24th December, 1863 and 4th January, 1864, addressed by him on the subject of his general collections derived from the cavern of Bruniquel, to the Trustees of the British Museum, determined me to avail myself of the liberty of action confided to me when those letters were referred to me by the Trustees. I proceeded at once to the Château de Salette to inspect the collection there in the possession of M. DE LASTIC, and soon afterward, 23rd January, 1864, visited Bruniquel in order to examine the cavern itself. The human crania discovered in the recess *b*, fig. 4, had been left *in situ* by M. DE LASTIC expressly for my examination.

The evidence of the former soft state of the earth or muddy part of the breccia, in its conformity with the superficial contour of the calvarium (Register-No. 38307, British Museum), was clearly shown. An unusual number of the large broad water-worn blocks or pieces of limestone had been piled, one above the other, for an extent of 3 feet above the crania, all firmly cemented together by intervening breccia, and suggested to me, what I stated at the time to M. DE LASTIC, that they had been placed over the crania for protection of the corpse or in a sepulchral relation thereto. Their numbers and arrangement called to mind a similar use of such stones accumulated at the places of interment of some of the ancient British, as, *e. g.*, that of the barrow on Balliden Moor, Derbyshire, figured in DAVIS and THURNHAM'S 'Crania Britannica'†.

In excavating beneath these crania several parts of the human skeleton were brought to light, in relative positions suggesting such a degree of dislocation as might be produced by the superincumbent mass of material subsiding and pressing upon the skeleton as

[* The finding of human remains in the positions *d* and *f*, fig. 4, was fortunate and instructive. The mass of matter accumulated in a cavern undergoes slow change, affecting bulk, by the draining off of the water which held in solution the salts and in suspension the soil precipitated as mud: such shrinking of the consolidated and calcified mass tends, especially in a basin-shaped cavity like the Bruniquel-cavern, to withdraw the mass from part of the periphery of its containing basin. Into fissures so formed small objects, such as flint-knives or other weapons of the human inhabitants, are liable to slip and descend to some depth. But the fissure is gradually closed by stalagmite from the drip. Thus, indications of them may be detected at depths associated with remains of extinct animals, and a conclusion as to contemporaneity may be erroneously formed. Although there was no evidence of such marginal or peripheral fissures, due to natural causes such as are above referred to, having existed of width enough to admit a human skull, it was satisfactory to know that human remains were not exclusively met with at or near the periphery of the brecciated mass forming the floor of the cavern.—July 1869.]

† Part I. p. 45.

the soft parts decayed and were dissolved away, above which such mass had been heaped. The breccia including such bones was unusually hard and brittle.

In the shallow lateral recess, *g*, fig. 4, I discovered, at about 5 feet below the line or shelf of stalagmite, the portions of a human cranium (which are now readjusted in specimen, No. 38308, British Museum). The breccia adhered so firmly, by means of the intervening layer of stalagmitic matter, to the portion of frontal bone, as to bring away the outer table and expose the diploë and part of a frontal sinus in the attempt to detach this part of the skull (Register-No. 38310, British Museum). The care and pains requisite to detach the bone from the breccia can only be appreciated by those who have bestowed them in the attempt to overcome this most difficult part of the quest.

My interpretation of the layer of stalagmitic matter which intervenes between the bone itself and the mould of breccia, is, that the plastic breccia was moulded, soon after the interment of the coffin-less corpse, to the scalp and hair covering the calvarium; and that as these dissolved away their place was taken by the infiltrating calcareous material, which also lines for a certain thickness the interior of the crania (as shown in No. 38310).

In every part of the superincumbent breccia there were scattered implements of flint and bone, with bones or fragments of bones and antlers of the animals introduced by man into the cave for food.

The chemical constitution of the human remains, its correspondence with that of the other animal remains, the similarity of their relations to the surrounding breccia, the evidences of the plastic condition of the brecciated earth at the period of interment of the human bodies, all concurred in producing conviction in my mind of the contemporaneity of the foregoing human remains with the other organic contents of the cavern, and with the implements the application of which by man's hand to various purposess was abundantly and unmistakeably evidenced.

Under the conviction that the cavern of Bruniquel had yielded undoubted evidence of the bones of the human beings who inhabited the cavern at the period when flint and bone were the sole materials of their weapons and other implements, and when, as will be subsequently demonstrated, quadrupeds now extinct, and other quadrupeds now restricted to the extreme north of Europe, abounded in the South of France, I spared no pains to secure the collection for the British Museum; and, having succeeded, I have devoted such time as other duties permitted, in preparing the description of these human remains which I now submit to the Royal Society. Their interest consists in the high probability that they are the most ancient authentic specimens, hitherto discovered, which afford cranial and dental characteristics of the human race of such period*.

* [Of the human remains in the sepulture at Aurignac, inferred by M. Lartet to have been contemporaneous with *Rhinoceros tichorhinus*, *Hyœna spelœa*, and *Elephas primigenius*, there were none attributable to an individual of large or even of middle size:—"Sur une dizaine d'os humains qui étaient restés engagés dans la terre meuble de la sépulture il n'y a aucun qui puisse être attribué à des sujets de taille grande ni même moyenne."—Bulletin de la Société Philomathique de Paris, Séance du 18 Mai, 1861. Apparently materials for charac-

I propose to submit to the Society a description of the other organic remains in future communications.

The portion of human skull remaining in the mass of breccia (Register-No. 38300, British Museum) consists of the hinder three-fourths of the cranium, including the occipital, parietal, and a great proportion of the sphenoid and temporal bones.

	inches.	lines.	inches.	lines*.
The extreme length of this portion of cranium is	6	6	6	1
The extreme breadth, outside the bases of the zygomatic arches	5	4	4	7
The extreme width of the cranial cavity	4	7	4	8
The extreme height of ditto	5	0	4	10

The foramen magnum measures 1 inch 9 lines in long diameter, 1 inch 3 lines in transverse diameter†. Its plane is nearly horizontal, as in other human skulls. The cranial cavity swells out 2 inches behind the posterior margin of the foramen.

The occipital condyles show the usual form and position. From the inner border of the left condyle to the outer border of the left mastoid process measures 2 inches 1 line. The mastoid presents the average development, indicative of the muscular forces concerned in balancing and moving the head in the ordinary erect posture of the human race. The pterygoid process is too delicate to allow of the thick incrustation of stalagmite to be removed, but it presents the usual length and other proportions.

The glenoid cavity and 'eminentia articularis' with the basal parts of the zygomatic arches exhibit precise conformity with the human type of these cranial features.

The thickness of the cranial walls, where fractured, across the fore part of the parietal and the temporal (squamosal) bones is not greater than that of the average European female skulls; it does not exceed two lines and a half at any part, and is from one to two lines thick at the major part of the circumference.

The interior of the cranium is lined by a thin layer of stalactite; the parts of the exterior in the angles between the stones, where the earth of the breccia had not come into contact with the bone, are coated with stalactite to a thickness, at some parts, of 4 lines.

Where the unbrecciated earth or mould has come in contact with the skull it is adapted to the inequalities of the surface, with the interposition above mentioned of a thin layer of stalagmite; and the earth has been hardened into breccia in that moulded

terizing the race were not obtained. The major part of the human remains had been re-interred prior to M. Lartet's visit. Of the human mandible disinterred at Moulin-Quignon, near Abbeville, under the circumstances detailed by M. Boucher de Perthes, in the 'Compte Rendu de l'Académie des Sciences,' Paris, 20 Avril, 1863, p. 7, it would perhaps have been more to the interest and influence of science if one were not obliged to refer to 'Comptes Rendus de la Académie des Sciences,' Avril 20, 27, Mai 4, Mai 18, Mai 25, 'Times Newspaper' of 25th April, and other 'brochures' which appeared in 1863 on the subject of this doubtful fossil.—R. O., July 1869.]

* Negro skull, No. 96. See Owen, 'Skulls of Western Equatorial Africans,' figs. 7, 8, 9, pp. 12, 15, in Du Chaillu, Second Journey in Equatorial Africa, 8vo, 1867.

† In an Australian skull the foramen magnum has a circular form of 1 inch 4 lines diameter.

relation, precisely as we find the breccia and stalagmite in relation to the bones of the extinct quadrupeds and to the flint implements contained in the same mass.

Near the skull are some cervical and dorsal vertebræ, the former dislocated, some of the latter in natural juxtaposition with portions of the ribs. There is also the head of a femur closely adherent to the stalagmite moulded upon its articular surface, the rest of the bone having been broken away with the previously detached block of breccia, exposing the fine cancellous structure of the head of the femur.

The general arrangement, or rather disarrangement, of the fragments of the human skeleton in the present mass of breccia, suggests that the body had been originally interred in a sitting or crouching posture, and that after decomposition and dissolution of the soft parts, the skeleton had yielded to the superincumbent weight; the head having become detached for a short distance from the neck. Every appearance supports the inference that the human remains are contemporaneous with the other organic contents of the breccia.

This mass of breccia includes some of the flattened water-worn stones, of which many were introduced into the cavern, from the bed of the adjacent river, evidently for use as seats, anvils, fire-places, &c.; and from the greater number of such stones above the place where the human skulls were exposed in the recess of the cavern, marked *b*, fig. 4, I was led to infer that they had been thus placed to cover the interred body, or in some sepulchral relation therewith. There are many smaller irregular portions of stone in the mass; and the mud, in some parts of a brownish colour, in others blackish, is calcified or petrified by the infiltrating drip of the cavern.

The larger blocks of stone consist of the same kind of greyish limestone of which the greater part of the neighbouring rocks is composed. There is a reddish-coloured limestone in smaller fragments, which kind also appears, variegating the colour, in some parts of the cliffs. There is also a piece of micaceous schist about 4 inches diameter in the same mass of breccia.

I caused a cast to be taken of the interior of this hinder portion of cranium in elastic material, from which a mould was prepared affording casts in plaster of Paris, which convey an instructive idea of the size and form of the back part of the brain of the old cave-dweller.

The posterior lobes of the cerebrum are narrow but prominent, projecting beyond those of the cerebellum. The breadth of the cerebellum is 4 inches 1 line, the length of each lateral lobe is 2 inches 6 lines.

In extracting what appeared to be the more perfect of the two crania partially exposed in the recess *b*, fig. 4, the breccia was fractured with different parts of the cranium attached to the different pieces. The portions of cranium having been detached from the breccia were found on reunion to compose an almost entire 'calvarium' of one individual (Register No. 38308, British Museum). This, after the calcareous matrix had been entirely removed from both outer and inner surfaces, was soaked in a solution of gelatin to restore its original tenacity.

Although it does not include so large a proportion of the skull, it is more instructive in some respects than the preceding portion from the locality *a*, as it gives the length as well as the breadth of the cranial cavity.

It consists of the entire upper part or half of the cranial dome, usually termed the 'calvarium,' including the major part of the frontal, both parietal, and of the expanded superoccipital bones.

The following are admeasurements of the cranium afforded by this specimen, to which I append corresponding ones of a cast of the 'Engis skull,' which it resembles in shape though relatively shorter:—

	Bruniquel cranium.		Engis cranium*.	
	in.	lines.	in.	lines.
Extreme length, or antero-posterior diameter, at the outer surface	6	8	7	9
Extreme length, or antero-posterior diameter, at the inner surface	6	0		
Extreme breadth, or transverse diameter, at the outer surface . .	5	7	5	6
Extreme breadth, or transverse diameter, at the inner surface . .	5	2		
Length of the sagittal suture, following the curve	5	0	5	3

The broken margins of the calvarium show the varying thickness of the bones; at the frontal, which is broken away 2 inches 9 lines from the coronal suture, the bone is 4 lines in thickness, and gradually decreases to 2 lines and $1\frac{1}{2}$ line in thickness as it approaches the parietal. The fractured margin of the parietal, near the frontal, and 3 inches in a straight line from the sagittal suture, shows a thickness of 3 lines, which decreases towards the lower border of the parietal (on the right side) to 1 line, with obliteration of the intervening diploë; at the middle of the parietal the thickness of the bone is $4\frac{1}{2}$ lines.

The superoccipital is fractured about half an inch below the lateral sinuses, at the upper part of the cerebellar fossa, where the pressure of the cerebellar lobes within, and of the complexi muscles without, reduces the bone to a thin compact plate of $\frac{1}{4}$ of a line at some parts. The portion preserved has the shape of almost an equilateral triangle.

The superoccipital, above the 'superior curved line' or ridge, is rather more protuberant than usual, and shows the pair of convexities answering to the posterior cerebral lobes. The occipital tuberosity is not distinct from, or more prominent than, the transverse ridge of which it forms the middle part; below the ridge the superoccipital shows a concavity vertically, not divided by a vertical crest, of which only the beginning is indicated at the 'protuberance.'

The cerebral fossæ are well-marked smooth concavities on the inner surface of the superoccipital, the left, as usual, being the larger; and the superior longitudinal sinus descending to the right of the crest for the 'falx cerebri,' which divides the cerebral fossæ. The course of the lateral sinuses is marked by thick obtuse ridges diverging

* Regarded by the experienced anthropologist 'Pruner Bey' as exhibiting "le type celtique parfait."—Bulletin de la Société d'Anthropologie, 8vo, 1863, p. 305. Unfortunately, like the 'Neanderthal' skull, wanting the required demonstration of its antiquity.

from the protuberance of the 'torcular Herophili,' and showing very slight excavation for the sinuses themselves.

The broadest part of the superoccipital here preserved measures in a straight line 4 inches. The parietals present the usual smoothness and convexity externally; the 'eminence' indicative of the commencing point of ossification is not distinctly marked; the temporal ridge or boundary is very feebly indicated. The venous 'parietal' foramen is larger on the left than on the right parietal; in both about 5 lines from the sagittal suture, and above $1\frac{1}{2}$ inch from the lambdoidal one. The crenations of the sagittal suture are moderately developed externally, and are wanting internally. On the inner surface of the parietals the cerebral convolutions have left feeble impressions; the middle meningeal artery deeply grooves the anterior inferior part of the bone close to the coronal suture; posterior to this are less deep grooves for other branches of the meningeal arteries; the shallow depression for the superior longitudinal sinus is chiefly in the right parietal. The pacchionian depressions are few and feebly marked.

The part of the frontal bone preserved indicates it to be low and narrow; but its anterior part is broken away before the commencement of the 'frontal crest' leading to the 'foramen cæcum.' We have better evidence, therefore, of the want of breadth of the frontal than of the extent of the vertical part of the bone forming the forehead. I much regret having been unable to secure the superorbital ridge.

The fractured anterior margin of the frontal shows no trace of frontal sinus, but the bone is evidently broken away above those cavities. The greatest breadth of the frontal here preserved in a straight line is 4 inches 7 lines, that of the Engis skull is 4 inches 8 lines. The 'sulcus longitudinalis' is feebly marked. The crenations of the frontal suture are very minute as it extends from the sagittal suture until near the lower angle. The frontal eminences are not distinctly raised.

Upon the whole the proportions of the above-described calvarium are those of the longish oval, approaching to that which has been denominated the cymbicephalic or dolichocephalic type, *i. e.* 'boat-shaped' or 'long-shaped' cranium. It is broadest near and in advance of the junction of the middle and posterior thirds, whence it contracts rather rapidly backward, and with a slightly convex curve to the narrow prominent upper part of the triangular superoccipital which forms a stronger convexity, agreeing with the Celtic type, as exhibited by the Engis skull, and differing from the dolichocephalic form as exhibited by the Australian skulls, one of which I have selected to contrast with the calvarium from Bruniquel.

The following are dimensions of admeasurements above recorded of the Cavern-skull, as shown by the Australian cranium:—

	inches.	lines.
Extreme length, or antero-posterior diameter, at the outer surface .	7	7
Extreme length, or antero-posterior diameter, at the inner surface .	6	9
Extreme breadth, or transverse diameter, at the outer surface . .	5	4
Extreme breadth, or transverse diameter, at the inner surface . .	5	0

	inches.	lines.
Length of sagittal suture, following the curve	5	5
Breadth of superoccipital, in a straight line	3	9
Breadth of frontal, in a straight line	4	1

The cranium of the Australian contracts more at the frontal region, and slopes more from the sagittal tract; the parietal eminences are more distinct; the temporal ridges are more strongly marked; the texture of the cranial bones is more dense, but is not thicker than at the frontal region of the cavern-cranium.

Compared with an ancient Greek cranium, that from the cavern is less arched or elevated in the parietal and frontal regions, and is more convex in the superoccipital region.

The following are dimensions of the Greek cranium:—

	inches.	lines.
Extreme length, or antero-posterior diameter, at the outer surface	6	9
Extreme breadth, or transverse diameter ,, ,, . .	5	2
Length of sagittal suture, following the curve	5	0
Breadth of superoccipital in a straight line	3	9
,, frontal in a straight line	4	4

The only specimen that gives indication of the curve or convexity of the forehead is part of the left half of the frontal bone (Register-No. 38310, British Museum), from which a great part of the outer table has become detached, adhering to the breccia broken by the blows of the pick-axe which brought this evidence of human structure to light, in the recess *b*, fig. 4. One of the frontal sinuses has, by the same cause, been laid open.

The portion of the outer table remaining, shows the beginning of the external orbital process, but the form and degree of prominence of the superorbital ridge are not given. On the inner surface the frontal crest with the beginning of the 'sulcus longitudinalis is preserved.

The following are other portions of human crania obtained at from 4 to 5 feet in depth, from the recess *b*, No. 4.

A portion of the right parietal and a small contiguous portion of the superoccipital (Register-No. 38311, British Museum). A parietal foramen marks the contiguity of the border near which it is placed to the sagittal suture. The degree of convexity of the outer surface of the parietal, the non-indication of a parietal eminence, the convexity of the attached part of the superoccipital, the evidence of its triangular shape, the feeble indication of the temporal ridge, and the thickness of the bone are all characters in which the present fragment closely agrees with the more entire calvarium previously described.

A portion of the left parietal, including the parietal foramen, and the upper part of the middle meningeal artery (Register-No. 38321).

A portion of a parietal bone with the impression of a branch of the meningeal artery, showing a thickness of $4\frac{1}{2}$ lines or 11 millimetres (Register-No. 38314, British Museum).

Part of the left parietal and frontal bones (Register-No. 38309, British Museum), showing thickening of the frontal and a similar low form of forehead to that in the calvarium (No. 38308). This portion shows part of a hole of about an inch in diameter, where so much of the bone appears to have been depressed or beveled off prior to interment. Two portions of left parietal bone, one with parts of the squamous and coronal sutures (Register-No. 38316, British Museum), the other with a parietal foramen (Register-No. 38317).

In a block of breccia from the same recess and depth was found the following portion of the lower jaw of an adult (Register No. 38335, British Museum).

The horizontal part of the left ramus with the symphysis retaining the first true molar, *m* 1, and the sockets of the two incisors, canine, two bicuspids and second true molar, of the same side: the socket of the third true molar, if it ever existed, has been obliterated, consequent on early loss of that tooth.

The sockets of the incisors are relatively smaller, especially in fore-and-aft diameter, than those in a female Australian; they more nearly accord in size with those of the European; the sockets of the premolars or bicuspids are simple, without the ridged indication of the grooved beginning of a division of the fang, as in the Australian. The socket of the second premolar is placed obliquely, and is divided, as usual, by a thicker septum from that of the first, than is the septum between any of the antecedent sockets. The first true molar is worn flat down to the stumps, sloping slightly from within outward and downward; a small part of the enamel is preserved on the inner ends, the friction, as usual, in human lower molars being greatest towards the outer margin of the crown; a smooth field of dentine composes the chief part of the grinding-surface: this molar is implanted, as usual, by two fangs, subcompressed from before backward.

The socket of the second true molar shows a similar insertion of that tooth, and that the anterior fang was grooved longitudinally at its fore part, and was larger than the posterior fang.

The fore part of the base of the coronoid process, which is preserved, shows the ridge extending to the back part of the last alveolar, and marking the boundary of the insertion of the temporal muscle. External to the ridge is the broad and shallow groove continued, contracting, along the outside of the hinder alveoli and bounded externally by the 'external oblique ridge' continued from the front margin of the coronoid process. The ridge subsides before reaching the 'mental foramen' here situated beneath the second premolar.

Beneath the foramen is a well-marked ridge for the origin of the 'depressor anguli oris' and for the insertion of the 'platysma myoïdes.' The symphysis developes anteriorly a well-marked 'mental process' or chin, the contour exemplifying a higher type than in the Australian; but the chin is of less vertical extent than in average-sized male jaws of Indo-european races.

Above the tubercular ridge at the back of the symphysis giving attachment to the genio-hyo-glossi muscles, is an unusually deep depression with a small foramen at the

bottom: the ridge is not so distinctly divided into a pair of tubercles as in most human mandibles, nor is the second lower pair of tubercles marked, which give attachment to the genio-hyoid muscles. The sublingual depression is not well defined. The mylo-hyoidean ridge begins below the root of the second premolar, and has the usual course, rising obliquely to the inner and back part of the last alveolus. Above the ridge the inner surface of the jaw presents the usual smoothness, indicative of the vertical extent of reflection of the mucous membrane of the mouth, and it is rather convex vertically; below the ridge the surface is less smooth, and is convex vertically before bending to form the thick under-border of the mandible.

I have noticed in Australian skulls that the mylohyoid ridge is nearer the alveolar border of the mandible than in European skulls; showing that the mouth was less deep behind the large grinding-teeth, whilst the depression for the submaxillary gland was greater vertically. The cave-dweller resembles the European in the position and obliquity of the mylohyoid ridge.

In the less compacted breccia beyond the middle of the cavern at *d*, fig. 4, at a depth of about 4 feet from the surface, from which some portion had been removed during previous explorations, were discovered the upper (Register-No. 38334, British Museum) and lower (ib. 38337) jaws, and portions of the cranium of a child of about four or five years of age.

The deciduous dentition was in place and somewhat worn; the alveolus of the first true molar, *m* 1, intervened between the last deciduous molar, *d* 4, and the coronoid process of the lower jaw, and contained the calcified crown of that tooth, visible through the wide aperture of the formative socket which the gum had covered.

I have compared these remains with the skull of a child from an ancient Greek tomb, and with a skull of a child of the Murmi tribe inhabiting Nepal, both of about the same size and with the same phase of dentition as the Cavern remains.

The premaxillo-maxillary suture shows the same degree of obliteration as in the Greek child; more of the palatal portion is preserved in the Nepalese child; the intra-nasal portion of the suture persists, and the external portion is wanting, in each. The line of the front border of the premaxillary below the slightly prominent nasal spine is as vertical as in the Greek skull. The gubernacular orifice of the first incisor is the largest, that of the canine the smallest; the usual increase of thickness is shown in the septum dividing the alveoli of the canine and outer incisor.

The deciduous molars of the cavern-child strictly accord with the human type; the first of the upper jaw, *d* 3, has the two chief outer and inner risings of the crown with the notch near the posterior part of each. The second deciduous molar, *d* 4, is quadricuspid, with the antero-internal and postero-external cusps united by the oblique ridge: this tooth is rather larger in the cavern-child than in the Nepalese.

In the lower jaw of the cavern-child the ascending ramus is rather broader and lower than in the Nepalese; the chin is as well formed. The molar teeth closely conform, with the same degree of superiority of size in the second, *d* 4, of the cavern-child, and

with rather more distinctness of the five tubercles, especially of the hindmost. In the position of the mental foramina and of all other characters of the mandibular bone the human type is closely preserved in the cavern-child. The condition of the bones, as to the degree of loss of gelatine, was the same as in the skulls of the adults.

Nearer the fore part of the cavern and to the right of the preceding locality, and at the same depth, were portions of the bones of an infant in a very fragile and far-gone condition, of which only the fore part of the lower jaw (Register-No. 38336, British Museum) and parts of a parietal, frontal, and superoccipital were extricated from the adherent breccia. The mandibular portion included the sockets of the incisors and canines, with those of the right deciduous molars. The first of these was emerging from the socket, as in an infant of about the tenth month; the apex of the deciduous canine had not pierced the gum; only the four inferior incisors had been in place. The mental prominence is well marked in this mandible; also the pair of fossæ behind the symphysis, for the geniohyoid muscles.

Whenever a sufficient number of skulls has been obtained from any given locality or country, or entombments of a period, the tendency of the brain-case to vary in its size, shape, and proportions to the face becomes manifest. This is exemplified in the 'Crania Britannica' of DAVIS and THURNHAM; in my own "Report on the Skulls of Natives of Nepal"*, and in the 'Crania Helvetica' of Professors HIS and RUTIMEYER. Among the figures in the latter work may be noticed both brachy- and dolicho-cephalic crania of the pre-Roman period, of the Roman period, and of the Burgundian period; even the few skulls obtained from the 'Pfahl-bauten,' or lake-dwellings, exhibit well-marked varieties. We learn, therefore, a wholesome distrust of generalizations as to the cranial characteristics of a particular race, or of the people of a particular period.

The calvarium from Bruniquel closely resembles in size and shape that from the Lake-dwelling at Mörigen-Steinberg, B VII; and also that from an ancient place of sepulture at Bolair. W. B VI. Like them it presents a good oval contour, and shows no mark or indication of an inferior or transitional type. The cerebral capacity is but small, is less than that of the skull from the Neanderthal cave, which in the development of the region of the frontal sinuses and superciliary ridge, closely resembles the old Batavian skull figured by BLUMENBACH in his last 'Decade,' No. LXIII.

The conclusions which I deduce from the examination of the foregoing facts of the human skeleton discovered in the Cavern of Bruniquel are as follows:—

They exemplify the distinctive characteristics of the human genus and species, as decidedly as do the corresponding parts of the present races.

They show most affinity with the oldest Celtic types, the cranium being oval, and rather dolicho- than brachy-cephalic in its general proportions.

The cranial capacity or brain corresponds with that of uneducated Europeans of Celtic origin; and exceeds that of the average Australian aboriginals.

* Report on Skulls of various tribes inhabiting Nepal, British Association Report, 1859, p. 97.

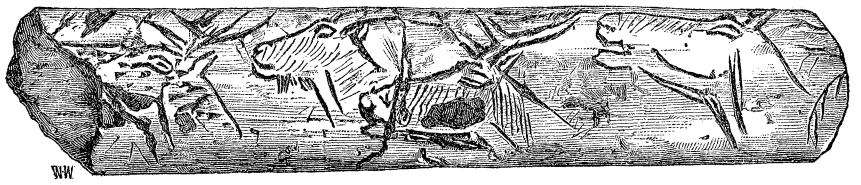
From the paucity of human remains as contrasted with those of the lower animals in the cavern, it may be inferred that interment therein was exceptional. It might be reserved for the family of the chief of the tribe.

The specimens of ancient art figured in cuts 5 & 6 were detected by Vicomte DE LASTIC ST. JAL on removing the breccia from those implements in 1863, and were shown by the

Fig. 5.

Portion of wing-bone of a bird with incised outlines of the head of Reindeer (*Cervus tarandus*); from the Cavern of Bruniquel.

Fig. 6.



Portion of rib of a Deer, with incised outlines of the heads of Reindeer and Bouquetin; from the Cavern of Bruniquel.

Vicomte to me on my first inspection of the Collection from the Cavern of Bruniquel, at the Château de Salette, January 22nd, 1864. They were afterwards shown by the Vicomte DE LASTIC to MM. MILNE-EDWARDS and LARTET on their visit of inspection at Salette, February 2nd, 1864, and are noticed by those gentlemen in the communication made to the Academy of Sciences, February 8th, 1864. (See the 'Compte Rendu' of that 'Séance' of the Academy.)

I subjoin a copy of the 'Letter' in which the name of the discoverer of outline drawings on bone by cave-dwellers of a 'Flint-period,' and the date of the determination of a species now extinct in the locality so inhabited, as a subject of such drawing, are given.

"Salette, January 24th, 1864.

"DEAR SIR,—I arrived at St. Antonin on Thursday evening, was met by Vicomte DE LASTIC and driven to the Château, where we arrived about 6 P.M.

"Friday, 22nd, was spent in examining the collection here. It is the most numerous, varied, and perfect series of the works in flint and bones of the earliest known human race that exists; it includes also a rich series of the remains of beasts and birds of the Cavern of Bruniquel from which the implements were obtained, and, above all, it contains the most unequivocal evidence of human bones, in conditions of imbedding demonstrative of their belonging to the earliest inhabited period of the cavern.

"In the present phase of research into Man's antiquity, and the general interest felt in that supreme question in his history, it is most important that these evidences be secured for the British Museum. Yesterday (23rd) I accompanied Vicomte DE LASTIC to the

cavern itself, in his property at Bruniquel, which is about twenty miles from Salette, and explored that cavern and three other cave abodes of a more recent (bronze-age) date in the same grand escarpment or precipice of Jura limestone.

"In a recess of the cavern I saw a human cranium (the calvarium or upper part) *in situ*; a part of this had been exposed by M. DE LASTIC in his last visit, and he directed it to be left until my arrival: it was imbedded in the breccia about 4 feet below the level of the upper floor of stalagmite. Of the veritable original position in the firmly cemented mass of mud, hardened or petrified by infiltrated calcareous matter, with pebbles and water-worn stones, and here and there portions of Reindeer's bones, there was no room for doubt. The human remains in the Museum previously discovered are in a similar matrix; the precise positions where they were found were pointed out to me by workmen and the Vicomte. *Parts of the matrix show the moulding of the mud to the cranial dome before it became petrified.* There are remains of women and children as well as of men. The animal remains which I have hitherto determined belong to the large *Reindeer*, the *Red Deer*, gigantic *Ox*, a large *Horse*, *Fox*, and three kinds *of birds*, all (save Fox) seemingly introduced by the cave-dwellers for food (bones evidently broken for the marrow, &c.). The fragments of such bones are in heaps to be counted by thousands, and I may come upon other species of animals. M. DE LASTIC, since the first rough and unauthorized diggings by the Toulouse explorers, has walled up the entry to the cave, leaving a doorway in charge of his keeper. He has had three skilled diggers and cleaners of the remains at work with frequent superintendence by himself, carefully exhuming every tool and fossil; and the Museum here shows the result of that system. *Two implements exhibit an outline of an animal's head finely cut.* M. DE LASTIC pointed them out to me as of a Horse; but I discerned the Reindeer's profile and made out faint traces of the antler. *They are the earliest known works of graphic art representing a species now extinct in temperate Europe.* The perfection of the barbed instruments, of other various tools, of delicate needles, &c., is truly remarkable. Most of the specimens are in duplicate or multiples.

"The day was too far spent on Saturday to proceed with the extraction of the human calvarium and further exploration in that recess of the cave. On Tuesday, 26th, we shall again proceed to Bruniquel on this quest; I, however, exhumed with my own hands, on Saturday, bones and tools demonstrative of the conditions in which the previous acquisitions had been discovered and obtained by the Vicomte.

"Believe me, truly yours,

(Signed) "RICHARD OWEN."

"*To the Principal Librarian, British Museum.*"

"I certify the above to be a true copy from the letter (No. 970 of Letter-book, British Museum) of the date January 24th, 1864.

(Signed) "A. W. E. O'SHAUGHNESSY,
Assistant in the British Museum."